CHEMICALS

Success Story

USE OF RECOVERED PLASTICS IN DURABLE GOODS MANUFACTURING

Benefits

- Recovery of previously discarded re-usable plastic materials
- Energy savings of 85% over conventional virgin plastic production
- Through 2000, the cumulative energy savings have been 178 billion Btu
- Availability of more cost-effective raw plastic materials for industry
- Reduced environmental emissions from the plastic raw materials supply process
- Through 2000, the cumulative reduction in CO_2 emissions has been over 11,500 tons
- Reduced landfill requirements
- Through 2000, the cumulative cost savings due to reduced fuel usage are over $900,000

Applications

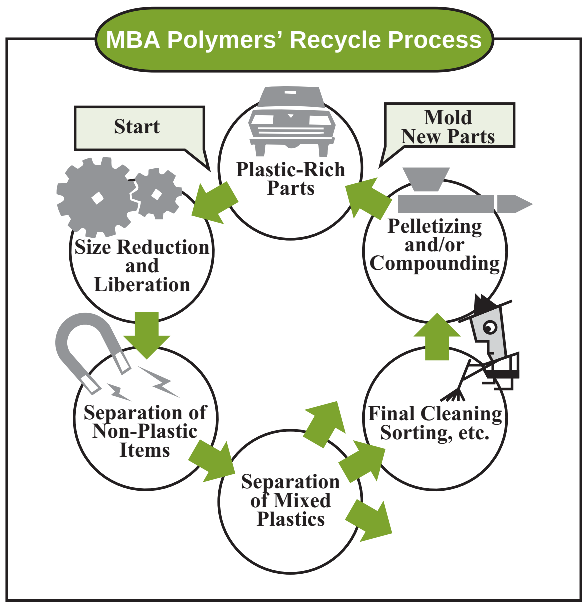
The MBA recovery process is effective in recovering plastic from complex manufacturing scrap and end-of-life durable goods such as automobiles, appliances, and electrical and electronic equipment.

The process continues to be applied to a variety of streams from various commercial sources. By the end of 1999 MBA Polymers had processed more than 5 million pounds of material and an additional 5 million pounds were processed in 2000. The process is economically viable for a large number of post-manufacturing streams now and is being demonstrated monthly on new streams.

New Process Increases Capacity and Efficiency of Durable Goods Plastic Recycling

The U.S. economy produces a considerable amount of plastic scrap from manufacturing and importing durable goods. For simple plastic products, packaging materials, and other single material goods, scrap recovery is straightforward. However, for more complicated products such as multi-component durable goods, the plastic scrap is often contaminated with paint, fillers, metals, foams, and other materials (including mixed plastic types) that make separation and recovery difficult. The stream of multi-component durable goods is growing in the U.S. as the population, product offerings, and consumer needs and wants continue to rise. This growth is also spurred by the increasing number of durable goods producers who are taking responsibility for the return of obsolete products. This situation is particularly dramatic in the computer industry where products are replaced well before the end of their useful life with faster, new technology. While useable components and precious metals are recovered, the plastic housing, which is by far the largest volume material, is discarded for lack of cost-effective recycling technology. Currently, less than 2% of plastic from computers is recovered, largely because of technical, economic, and infrastructure barriers.

In 1995, MBA Polymers, Inc., was awarded a NICE^3 (National Industrial Competitiveness through Energy, Environment, and Economics) grant to pursue commercialization of a new recycling technology for a variety of durable goods plastics.



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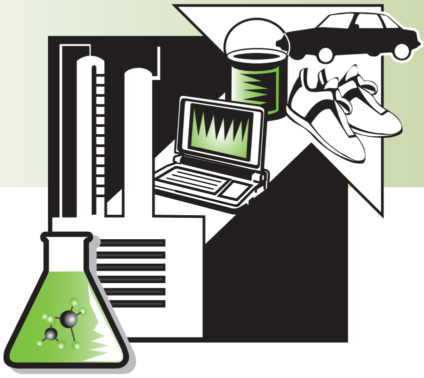

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Technology Description

The production of automobiles, appliances, and electronic equipment in the U.S. alone is estimated to consume approximately 8 billion pounds of plastic. Included in this plastic stream are acrylonitrile butadiene styrene (ABS), high impact polystyrene (HIPS), polypropylene, polyurethane, polyvinyl chloride, polyethylene, polyester, nylon, and polycarbonate. At an estimated overall manufacturing scrap rate of 10%, approximately 800 million pounds of post-manufacturing plastic scrap is produced annually in the U.S. Not only does plastic scrap consume valuable landfill space, but the lost energy content of the plastic is approximately 16 trillion Btu per year. MBA's process is also targeting post-consumer scrap which will be available in much larger quantities.

To avoid wasting this energy and useful material and to decrease the need for landfill, an advanced mechanical recovery technology has been developed by MBA Polymers with partial funding from the NICE^3 Program, the American Plastics Council (APC), and plastic end-users. MBA Polymers built a processing facility to overcome many of the challenges of recovering plastic from the manufacture of automobiles, appliances, and electrical and electronic equipment. MBA Polymers' processing plant is capable of running at rates over 5000 lb/hr and purifying as many as five different plastics from a single mixed stream.

Raw Material Pellets from Recycled Plastic

"If we can change the market demand for greener products, then we can change the way the manufacturers are making computers."

– David Stitzhal
President of
Full Circle Environmental
(a consulting firm)

"We've made the economics much more attractive, and that's what everyone's been waiting for."

– Mike Biddle
CEO of
MBA Polymers

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Project Partners

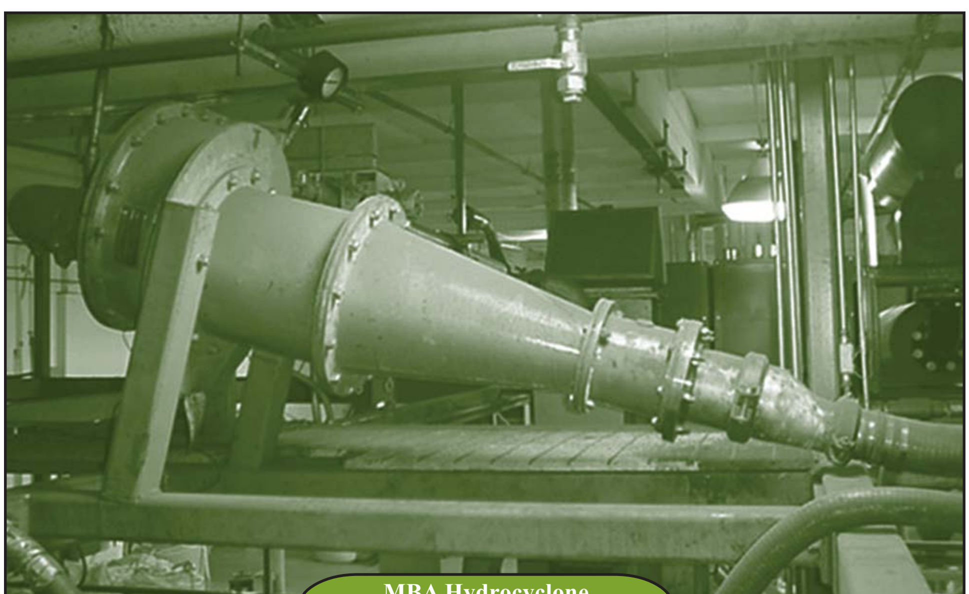
- MBA Polymers, Inc.
  Richmond, CA

- California Energy Commission
  Sacramento, CA

Conventional plastics cleaning and sorting processes (such as those used for bottle recycling) cannot handle multi-component waste streams. These streams require a process that can separate metal and metallic coatings, rubber, glass, foam, fabric, and mixed plastics. The new MBA process incorporates several advanced capabilities for reducing, liberating, separating, and cleaning materials. The process offers the following:

- Enhanced size reduction throughput and particle size and shape control.
- Reduced product and side-stream contamination.
- Enhanced process control of separation systems for multi-material separations.
- Advanced material separation.
- High throughput.

The process produces an advanced plastics recycling system that is capable of effectively recovering previously unrecoverable streams of multi-component materials.



MBA Hydrocyclone Plastics Separator

OIT

August 2001

Energy Savings and Pollution Prevention

The energy and related pollution savings from the MBA Polymers' plastics recovery process result primarily from the reduced need for producing virgin plastics. Virgin plastic consumes approximately 40,000 Btu/lb produced. Half of this energy is contained in the plastic itself as processed material and is lost if the scrap is not recovered or is incinerated. The other 20,000 Btu/lb is consumed producing the material. Approximately 3000 Btu/lb is consumed to recover this plastic with the MBA process and no "raw material" energy is used. Using recovered plastic instead of additional virgin plastic results in consumed energy savings of 17,000 Btu/lb of raw material or more than 85% of the energy required to produce virgin plastic.

This recovery of durable goods plastics also reduces pollutants by reusing some residual metals from the waste stream that would normally be sent to landfills. The process also reduces energy consumption, which greatly reduces SO_X, NO_X, and CO_2 emissions and particulates.

Recovered Plastics Process Energy Savings
(Million Btu)

2000	Cumulative through 2000
85,000	178,000

Process Emissions Reductions
(Tons 2000)

SO_X	NO_X	CO_2	Particulates
8.0	8.0	5,500	2.0

Industry of the Future — Chemicals

The chemical industry is one of several energy- and waste-intensive industries that participate in OIT's Industries of the Future initiative. In December 1996, the chemical industry published a report, entitled ***Technology Vision 2020: The U.S. Chemical Industry,*** *that helps establish technical priorities for improving the industry's competitiveness and develops recommendations to strengthen cooperation among industry, government, and academia. It also provides direction for continuous improvement through step-change technology in new chemical science and engineering technology, supply chain management, information systems, and manufacturing operations.*

OIT Chemicals Team Leader: Paul Scheihing (202) 586-7234.

NICE3 – National Industrial Competitiveness through Energy, Environment, and Economics: An innovative, cost-sharing program to promote energy efficiency, clean production, and economic competitiveness in industry. This grant program provides funding to state and industry partnerships for projects that demonstrate advances in energy efficiency and clean production technologies. Awardees receive a one-time grant of up to $525,000. Grants fund up to 50% of total project cost for up to 3 years.

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